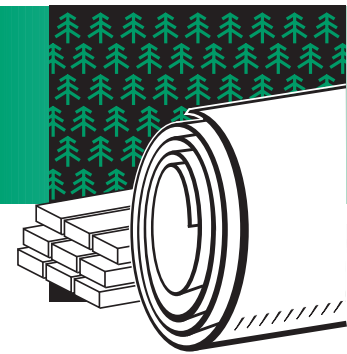


FOREST PRODUCTS

Project Fact Sheet

PREDICTIVE DIAGNOSTIC SYSTEM FOR DC MOTOR DRIVES



BENEFITS

- Projected energy savings of 7.79 x 10⁸ Btu per ENVAIR 4000 unit per year
- Unscheduled downtime in paper mill production facilities reduced by 80%
- Repair and replacement costs reduced by 70% through advanced warning and determination of the cause of the imminent failure
- CO₂ emissions reduced by 43% by the year 2010 industry-wide
- Potential energy savings in the pulp and paper industry resulting in cost savings of \$400 million per year

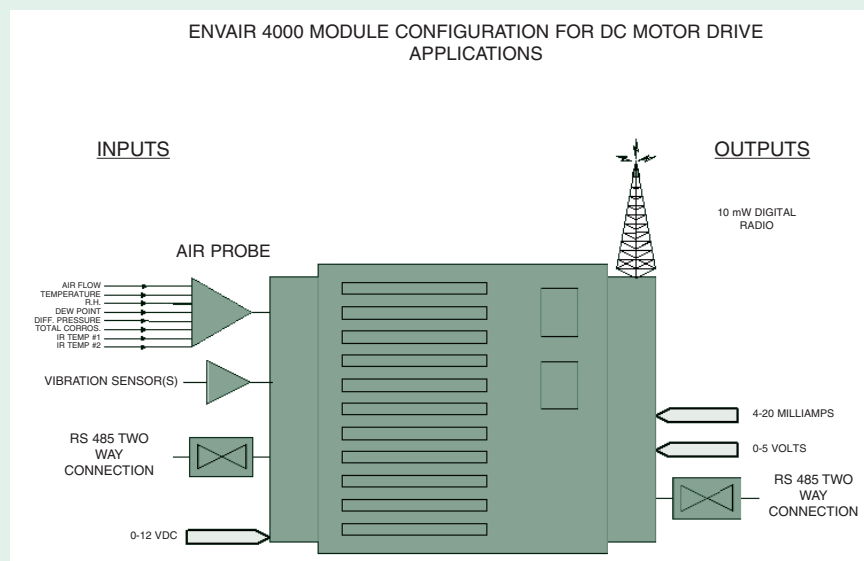
APPLICATIONS

Besides improving efficiency and energy savings in the forest products industry, this technology can benefit other DOE-designated Industries of the Future including aluminum, metalcasting, chemicals, glass, and steel.

EFFICIENT NEW MONITORING AND CONTROL SYSTEM PREVENTS UNSCHEDULED PAPER MILL PRODUCTION SHUTDOWNS RESULTING FROM DC MOTOR FAILURES

ENVATEC has addressed a major problem for paper producers with its ENVAIR 4000, a sensor and control technology that optimizes DC motor drive operations by simultaneously monitoring and analyzing eight inputs on DC motors. Attributes, such as motor air temperature, speed, vibration, relative humidity, presence of corrosive gases, airflow, and amperage, are measured for irregularities and then a signal is transmitted across the customer's facility on any network interface. This eliminates unscheduled motor shutdowns, thereby cutting energy costs tied to restarting. Based on successful prototype testing, the ENVAIR 4000 promises a 70% reduction in repair and replacement costs, an 80% reduction in unscheduled downtime and pulp waste, and a 43% drop in CO₂ emissions.

ENVAIR 4000 SYSTEM



By monitoring selected operating attributes of DC motor drives, the ENVAIR 4000 introduces a cost-effective troubleshooting system that increases efficiency while reducing energy consumption and production losses.



Project Description

Goal: The goal of this project is to demonstrate commercially the capability of the ENVAIR 4000 to monitor and improve DC motor performance by dramatically reducing downtime and to provide an equipment failure warning up to 10 weeks prior to the failure of DC motor drive systems.

In conventional paper manufacturing, DC motor systems usually fail without warning. In 1996, such failures led to an estimated nationwide loss of 6.08×10^{12} Btu. The ENVAIR 4000 system minimizes this loss through preemptive failure analysis by:

- Monitoring and analyzing eight inputs, including motor speed, vibration, relative humidity, commutator/brush temperature, corrosive gases, airflow, and amperage
- Using a polynomial distributive function to analyze the data from the inputs
- Indicating malfunctions or degradation of performance up to 10 weeks prior to total failure, giving ample time for replacement of parts
- Transmitting any information on abnormal motor functions via radio to a central computer for analysis and alerting appropriate maintenance personnel
- Transmitting monitored information over the Internet to other facilities to serve as a heads up for potential problems utilizing the same monitoring technology on other DC motor drives.

ENVATEC is demonstrating this new technology with assistance from the Maine Department of Economic and Community Development and the NICE³ Program in the Department of Energy's Office of Industrial Technologies.

Progress and Milestones

Tasks to be conducted under the NICE³ grant for ENVATEC include:

- Development, field testing, and implementation of a manual tracking system
- Design, construction, and pilot testing of polynomial analysis structure
- Construction of ENVAIR 4000 prototypes
- Testing of the DC Motor Drive
- Pilot testing of the polynomial analysis structure and artificial intelligence (LCPD) between JAVA computers
- Installing ENVAIR 4000 units at demonstration site
- Implementation of communication and artificial intelligence capabilities between two demonstration sites.

INDUSTRY OF THE FUTURE—FOREST PRODUCTS AND AGENDA 2020

*In November 1994, DOE's Secretary of Energy and the Chairman of the American Forest and Paper Association signed a compact, establishing a research partnership involving the forest products industry and DOE. A key feature of this partnership was a strategic technology plan—**Agenda 2020: A Technology Vision and Research Agenda for America's Forest, Wood, and Paper Industry**. Agenda 2020 includes goals for the research partnership and a plan to address the industry's needs in six critical areas:*

- Energy performance
- Environmental performance
- Capital effectiveness
- Recycling
- Sensors and controls
- Sustainable forestry

OIT Forest Products Team Leader: Valri Robinson (202) 586-0937.



NICE³—National Industrial Competitiveness through Energy, Environment, and Economics: An innovative, cost-sharing program to promote energy efficiency, clean production, and economic competitiveness in industry. This grant program provides funding to state and industry partners for the first commercial demonstration of energy efficient and clean production manufacturing and industrial technologies. Total project cost for a single award must be cost-shared at a minimum of 50% by a combination of state and industrial partner dollars. The DOE share for each award shall not exceed \$500,000 to the industrial partner and up to \$25,000 to the sponsoring state agency for a maximum of \$525,000.

PROJECT PARTNERS

ENVATEC
Jay, ME

Maine Department of Economic & Community Development
Augusta, ME

NICE³ Program
U.S. Department of Energy
Washington, DC

FOR PROJECT INFORMATION, CONTACT:

Joseph Conroy
ENVATEC
P.O. Box 2130
3 Adams Street
South Portland, ME 04239
Phone: (207) 741-2658
Fax: (207) 741-2543
jconroy@envatec.com

FOR PROGRAM INFORMATION, CONTACT:

Lisa Barnett
Program Manager, NICE³ Program
U.S. Department of Energy
1000 Independence Ave., SW
Washington, DC 20585
Phone: (202) 586-2212
Fax: (202) 586-7114
lisa.barnett@ee.doe.gov

Visit our home page at
www.oit.doe.gov

Office of Industrial Technologies
Energy Efficiency
and Renewable Energy
U.S. Department of Energy
Washington, DC 20585



DOE/GO-102000-0882
Order#NICE³FP-6
January 2000